The Ultrafast Lane:
How new fibre broadband investment can help British cities pull ahead

Report written by Professor Tony Travers & Don Levett

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ECONOMICS · RESEARCH · ANALYSIS

Case studies & research by Regeneris
Produced for BT Group

Foreword from BT

UK cities have long been the powerhouses of our national growth. They underwent major development and growth to meet the needs of our 19th century drive to industrialisation, but for their future growth, our cities must look to new industrial sectors and new kinds of enterprise.

They must offer the infrastructure investment that helps existing businesses to survive and thrive, and that encourages new businesses to start up and grow strong. We need to understand where those investments will have the greatest effect, and we need to be able to estimate the likely benefits in each city's case.

Foreword from BT continued

As a result of BT's £2.5bn investment, more than 15 million homes and businesses, including those in many of our cities across the country, can now access fibre broadband. By spring 2014, fibre broadband will be available to around 19 million premises – over two-thirds of the UK. Effective use of allocated government funding could see this deployment extended even further.

Fibre broadband can transform a city's prospects, connecting and empowering businesses within, across and between cities and ensuring they can engage effectively with the local and world economies and markets. Investment in broadband infrastructure will help revitalise and regenerate local economies, and improve our cities' competitiveness within the UK and in the global market.

We asked one of the UK's leading academics and commentators, Professor Tony Travers, to provide an insight into the future of our cities. He has looked at the development of urban Britain in recent decades, taking into account the impact of changes in the world economy and in Government policies, and looks ahead to the infrastructure challenges that face every city leader.

To support his findings and provide independent robust measures of the potential impact of fibre broadband, we commissioned Regeneris, the leading economic consultancy, to conduct an in-depth analysis for each of the cities eligible to bid for the Government's Urban Broadband Fund.

Their discoveries are unequivocal*.

- Cities are a key focus of future economic growth
- Modest, targeted investments in broadband technology – as an element of wider economic development plans – can provide the effective spur to growth that our cities so desperately need.
- The precise impact will vary from place to place, but businesses in every city can expect to benefit significantly.

BT will continue to work together with local councils and other partners in each city and make our contribution to bringing infrastructure investments to fruition, quickly and effectively. We can help plan your city's future and you can rely on us to be here to help you see it through.

Brendan Dick
Managing Director, BT Regions
June 2013

* These potential gains take no account of the additional benefits of fibre broadband to consumers or for the improved delivery of public services which may well add further benefits to the case but are not considered by this report

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About the authors
Professor Tony Travers is a British academic and journalist, specialising in issues affecting local government. He is the director of the Greater London Group at the London School of Economics and Political Science. He contributes a regular column to the Local Government Chronicle and has also written for The Guardian, The Evening Standard, The Independent, the Financial Times and The Times. He has published a number of books on cities and government. Don Levett is an Interdisciplinary Analyst with experience in urban regeneration startups, market research, strategy consulting and private equity. He has written for the Independent and the Evening Standard, and authored the report on the regeneration of Tottenham 'It Took Another Riot', launched by the Mayor of London.

About Regeneris
Regeneris Consulting is an independent economics firm that provides research-based advice to major corporates, developers, national government bodies and local government. Regeneris specialises in preparing robust assessments of economic impact, focusing on the impact of new technology, physical developments, policy changes or corporate impact. Regeneris work across the UK from their offices in London and Manchester.

See www.regeneris.co.uk for further information.

About BT
BT is one of the world's leading providers of communications services and solutions, serving customers in more than 170 countries. Its principal activities include the provision of networked IT services globally; local, national and international telecommunications services to its customers for use at home, at work and on the move; broadband and internet products and services and converged fixed/mobile products and services.

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Executive summary

This report examines how British cities have been affected by recent economic history and looks at the challenges that lie ahead. It considers the potential role of high speed fibre broadband in the further regeneration of city economies.

It is informed by in-depth economic analyses of the potential impact of fibre broadband rollout on the whole economy (Gross Value Added or GVA) of the UK's cities by Regeneris, the leading economic consultancy. The main purpose of the report is to consider how cities can use modest, targeted investments in growth enabled by broadband technology as an element in their wider economic development plans.

In the 35 or more years in which contemporary policy towards cities has evolved, councils have responded to 'challenge funding' and other initiatives by developing new and more effective local regeneration policies. Since the early 1980s, many older industrial cities have rebuilt their centres, improved public transport, attracted 'iconic' developments, and upgraded the skills' base of their populations. Over time, urban economies have revived.

Investing for growth

A key element in the renewal of British cities has been increased investment in the infrastructure necessary to make them competitive with other comparable places overseas, and that enable them to exploit agglomeration economies. Universities have expanded substantially, creating new academic and residential facilities. Arts, sports and conference facilities have been developed in a number of cities. Telecoms investments have tended to increase the comparative advantage of cities.

Councils and their leaders will have to go further in the years ahead in their attempts to lead growth. Indeed, at a time when central support for local government is being cut significantly, councils will find that economic growth will be one of the few ways they can generate additional resources. Cities will find themselves not only having to enhance their own economies, but doing so in competition with other cities.

Fibre broadband is one of the most attractive elements in a city's competitive offer. It can generally be delivered with lower-cost investment than many other kinds of infrastructure, and can also be achieved faster and with less impact on the city itself e.g. planning, building works etc. Regeneris' modelling work makes it possible to quantify the potential benefits to UK cities from investment in and constructive use of fibre broadband. The research suggests a wide range of likely impacts and that cities will be able to develop their use of new technology to enhance their economic prospects.

Global markets, local opportunities

If the UK is to remain competitive, effective access to the internet's global markets and software innovations will be essential, and we can expect that internet entrepreneurs will continue to develop new

products that take advantage of higher-speed data connections and their expanding international reach.

By some estimates, the internet economy accounts for over 8 per cent of the UK's GDP, and is expected to rise to over 12 per cent by 2016, contributing around £225 billion to the national economy. This is already the highest share of any country in the G20, and now accounts for almost a quarter of UK economic growth. Regeneris calculates that the introduction of superfast broadband to a given area could result in an increase in annual Gross Value Added (GVA) of 0.3-0.5 per cent, as take-up and usage of services build over time.

In 2010, the UK Government released refreshed plans for upgrading the nation's broadband network to deliver a universal minimum coverage of 2 megabits per second (Mbps) download speeds, and access for 90 per cent of households to 'super-fast' broadband with download speeds of 24Mbps or higher. It also announced plans for a 'Super-Connected Cities' programme (SCCP) to provide "ultra fast" download speeds of over 80Mbps, creating the Urban Broadband Fund, a £150m initiative designed to deliver ultra-speed broadband to 22 cities in two 'waves'. The respective local authorities had to submit bids for the funding, and each needed to demonstrate a viable business case.

The current UK Umbrella state aid clearance for Superfast broadband specifically excludes the SCCP funding and thus separate state aid approval will be required if this fund is to be used for direct infrastructure grants which is likely to significantly impact the timescales for delivery of the infrastructure elements of this programme. As a result the SCCP funds are, initially at least, expected to be focussed on a "Voucher" type scheme for SMEs to connect to existing infrastructure.

This paper however follows the approach of a 'whole city' business case as per the original SCCP programme to highlight the potential for "whole economy" benefits of such an approach, and specifies three UK case studies of expected benefits for two cities and one city region.

Understanding the index of impact

Regeneris has developed an index of future fibre broadband potential that provides an indication of the scale and relative impact of fibre investment across various cities based on objective criteria. The overall scale of impact will primarily be driven by the size of city and its business base and economy. The index measures only the potential impact on a city's business base. It excludes the potential benefits to residents in their domestic use of fibre broadband, and the role it might play in the delivery of public sector services, which may well provide additional GVA benefit.

The index suggests that the overall impact on productivity and business start-ups taken together is expected to be greatest in Brighton, Cambridge, Chelmsford, Bristol, Edinburgh and London. However, the significant differences between the development potential revealed by the economic analysis is sufficient to provide evidence of a need for greater civic skill in approaching the benefits of broadband investment.

New technologies tend to produce greater returns where conditions consistently encourage relevant economic development. The index suggests that cities with modern and expanding economic bases are more likely to experience benefits from investment in technology. Nevertheless, all of the areas considered are shown to benefit from new investments. British towns and cities face competition not just from each other but from cities in other countries that may have the advantage of being able to devote significant resources to improving their broadband networks without the state aid concerns that are present for cities in the UK and EU.

The Regeneris index demonstrates that all cities can gain positive benefit, and for those who are shown as likely to face a less confident future, their leaders will have to think carefully about how best to improve economic performance, possibly by consistent policy towards new sectors based on broadband investment. If they do not, they risk finding that other centres continue to grow faster in the longer term.

Investing to pull ahead

Widespread access to faster broadband will be critical for the continued growth of the UK's internet economy. Policymakers must choose whether the UK benefits from an infrastructure that helps us stay ahead of the curve, or suffers the competitive disadvantage entailed by playing catch-up.

Fast broadband alone will not bring the promised economic benefits as these involve a wider agenda of ensuring that those in need of the speed actually have access to it, and that everybody - in both the private and public sectors – understands the efficiency benefits that the latest technologies can bring to all organisations, small and large – complex or simple. City governments will want to consider these issues from the point of view of both local and international competition.

Research has found the roll-out of **fibre broadband** could **increase growth in GVA** over 15 years by up to **0.5%** p.a.

This report

This report examines how British cities have been affected by recent economic history and considers the challenges that lie ahead. It is widely recognised that the radical restructuring of the UK economy over the past 50 years has had disproportionate and negative effects on many of our cities.

Successive governments have attempted to mitigate these impacts and also to provide resources to redevelop city economies. There is significant evidence of successful transformations, and many traditional, manufacturing-based urban economies have been reinvented by the development of new service sector companies and activities. But the post-2008 recession has once again thrown into question the future of both the wider British economy and, as importantly, the successes of city redevelopment since the 1980s.

The report goes on to consider the potential role of high speed fibre broadband in the further regeneration of city economies. It is informed by in-depth economic analyses of the potential impact of fibre broadband rollout in the UK's cities by Regeneris, the leading economic consultancy. The latter part of the report argues for civic engagement in such telecoms improvements to provide opportunities for cities to compete in the rapidly changing global economy.

The main purpose of the report is to consider how cities can use modest, targeted investments in broadband technology that have the potential to deliver many times that investment, as an element in their wider economic development plans. Many studies examine the need for public transport, roads, energy and cultural investment. Far fewer consider the importance of improving the broadband assets that are the bedrock of personal and business communications, and are often taken for granted.

The impact of changes in the world economy for UK cities

De-industrialisation in the West; Industrialisation in the East

The story of global economic change is now well understood. Since the 1960s, Britain, and other countries which industrialised early, have seen a period of persistent de-industrialisation. The UK's coal, steel, shipbuilding, car-making and other manufacturing sectors have contracted. A similar trend has been observed in many other European countries and in the United States.

In parallel, industrialisation has led to rapid development within the economies of, among other places, China, South Korea, India and Brazil. Lower costs have allowed emerging economies to grow fast, with the effect of transferring many 'traditional' manual jobs from West to East.

In Britain, we have seen an economy where manufacturing has declined sharply, while services have increased. In 1964, manufacturing accounted for 46.6 per cent of UK GDP. By 2009, the figure was 23.1 per cent. During the same period, service industries grew from 53.8 to 76.8 per cent of GDP . This change has led to significant impacts on employment patterns and radical change in the need for labour of different kinds. Evidence suggests that the shift from manufacturing and other traditional industries is not yet complete, although the Government has spoken recently about the need to 'rebalance' the economy away from dependence on financial services. Superfast broadband will aid this shift.

Impacts on British cities since the 1960s

Many British cities grew rapidly as the result of industrialisation during the 19th century. Manchester, Liverpool, Sheffield, Glasgow, Bradford, Newcastle, Birmingham and Nottingham developed into very large urban agglomerations for the time. Industrialisation was the spur for urbanisation in many parts of the North, the Midlands, central Scotland and South Wales. New factories were built, attracting labour from the countryside, and leading to a need for millions of new homes in what became some of the world's largest cities. This process is being repeated today, at even greater scale, in China, India and in other developing countries.

The shift of manufacturing from Europe and the US to emerging economies hit cities hard. As factories closed, the industrial workforce found it hard to re-train for new jobs. Many of the new industries that have emerged since 1945, have tended to be in Southern England, away from the country's manufacturing heartlands. Many of the new consumer goods companies of the 1950s were built along the Thames corridor, west of London. Financial services and international tourism developed fastest in London and the south. Although London's docks closed, they were replaced by a large, new business centre in the city's Docklands.

Many cities in the North, the Midlands, Scotland, Wales and, indeed, some parts of London found themselves with substantial derelict ex-industrial zones, and also with high levels of unemployment. The search for new, replacement, industrial sectors began in the late 1970s and early 1980s. This search has influenced successive governments' policies.

Regeneration and Revival since the 1980s

Policy changes

Since the 1930s, successive governments have pursued policies designed to influence the location of economic activity and, from the 1970s, to regenerate urban economies. After the Second World War, efforts were made to reduce the concentration of industrial activity in London. Later, policies were adopted in an attempt to boost the economic fortunes of northern regions. By 1977, the government was sufficiently concerned with the 'inner cities' that new grants were given to declining urban areas in an attempt to regenerate them.

Michael Heseltine, Conservative environment secretary in the early 1980s, introduced 'challenge funding', which required localities to bid for Whitehall resources to improve infrastructure, encourage enterprise and clean up derelict areas. Development corporations were introduced to concentrate public investment and to incentivise private development. These changes have proved influential with governments ever since. Many lottery-funded arts and leisure projects were located in cities to act as a catalyst for tourism and new cultural industries. The last Labour government commissioned Lord (Richard) Rogers to chair an Urban Task Force, whose report built on the earlier initiatives.

In the 35 or more years in which contemporary policy towards cities has evolved, councils have responded to 'challenge funding' and other initiatives by developing new and more effective local regeneration policies. Since the early 1980s, many older industrial cities have rebuilt their centres, improved public transport, attracted 'iconic' developments, and upgraded the skills' base of their populations. Over time, urban economies have revived. Private sector job growth has occurred in many of the former industrial cities, particularly in and around city centres.

Investment in Infrastructure

A key element in the renewal of British cities has been increased investment in the infrastructure necessary to make them competitive with other comparable places overseas, and that enable them to exploit agglomeration economies.

- Tramways have been constructed in Manchester, Nottingham, Birmingham and Sheffield that have improved the functioning of their labour markets.
- Rail systems have been improved by strengthened transport authorities.
- Major initiatives to remove vacant sites and tidy-up city centres have occurred.
- Universities have expanded substantially, creating new academic and residential facilities.
- Arts, sports and conference facilities have been developed in a number of cities.

Until recently, the need to invest similarly in telecommunications and broadband infrastructure was not generally recognised. The rise of the internet and the increasing reliance of businesses of all kinds and sizes on high speed access and services, has propelled broadband investment to the forefront of infrastructure policy. Investments in telecommunications tend to increase the advantage of cities over less populous areas, as, due to better economies of scale, new technologies generally become available in urban areas ahead of rural ones.

Improvements in Governance

The resurgence of cities has been accompanied by radical improvements in the quality and consistency of much urban government. In particular, new models of governance have been developed, including directly-elected mayors, combined authorities, integrated transport authorities and development corporations. Leaders of cities have become nationally-known figures in a number of cases.

Directly-elected mayors were introduced by the last Labour government and are supported by the current administration. There are currently mayors in a number of cities, including Liverpool, Bristol, Leicester, Salford, Middlesbrough and London. In a 2012 referendum, a number of other cities rejected introducing mayors, though re-visiting the idea in future for city-regions cannot be ruled out.

The Mayor of London is one of the UK's best-known political offices and has attracted much attention to the city. Transport, policing, fire and emergencies, city-wide planning and urban regeneration have been brought within the Mayor's control. The Olympic Games were brought to London as the result, to a significant degree, of the London Mayor's activity. Tube investments and the massive Crossrail project have resulted from mayoral lobbying. Leicester and Liverpool have also gained prominence from adopting a mayor.

In Manchester, the city council and the nine other authorities within the Greater Manchester city-region have developed a powerful combined authority to deliver transport, economic development and planning objectives. This entity has been successful in pioneering a joint approach to development, involving sophisticated political and economic decision-making.

Most recently, the Manchester combined authority was able to negotiate a 'City Deal' with central government which allows it to retain some of the additional tax revenue associated with transport and other investment made locally. Other city-regions, notably Leeds and Birmingham, are now evolving their own combined authority governance models.

Integrated transport authorities have been developed from the passenger transport authorities that have existed since the 1960s. They offer a stronger city-regional governance structure to deliver better transport. Merseyrail, a subsidiary of Merseytravel, the city-regional transport authority, has been a particularly successful example of how a city's rail system can be turned into a locally-run, effectively-marketed, metro-style urban rail system. Other metropolitan areas have similar authorities.

Results

Most of Britain's major cities are now in a better condition than they were in the 1980s. Initiatives to revive urban economies have had some success, though there is still disagreement about which interventions have been most successful.

Some iconic cultural investments have worked well, others less so. New industrial sectors have developed, while others have declined. Cultural industries, tourism, financial and business services, information technology, retailing, leisure, transport and logistics, education, healthcare and, latterly, new media have generally expanded to replace older manufacturing and related activities.

New industry sectors are generally bigger users of telecoms and connectivity. The centres of most British cities are now attractive and developing, though locations just beyond central areas are often still in need of attention.

There are continuing academic debates about whether policies should be aimed at areas or individuals, though there seems now to be a consensus that both approaches are required. Looking ahead, the decline in public sector employment, coupled with uncertain economic growth, pose important questions about how the renewed dynamism of recent years can be sustained.

Why cities will remain important to economic growth

The Centre for Cities think-tank has estimated that UK cities generate 61 per cent of UK Gross Value Added*. The GVA per head of the UK's top performing cities – Aberdeen, Edinburgh, Cambridge, London and Oxford – was at least 150 per cent higher than the UK average in 2009.

According to the Centre, "The UK's cities also account for the lion's share of innovative activity. In 2010, they were responsible for 54% of patent applications. Cambridge, Aldershot, Oxford, Bournemouth and Aberdeen were amongst the most innovative cities. In 2010, Cambridge had 113 applications per 100,000 residents". The Centre also concluded that between 2000 and 2010 some leading British cities - notably Milton Keynes, Cambridge, York, Oxford, Swindon and Leeds - grew at approximately double the average rate for the country as a whole. Others, often smaller centres, still suffer relative economic decline.

British cities compete not only with each other, but also with those overseas. Governments and companies invest in city economies in different ways from country to country. Places such as Cambridge, Leeds and London are, respectively, in competition with places such as Boston/Cambridge (United States), Lyon (France) and Shanghai (China). It is important for British cities to compare themselves with centres across the world.

Looking ahead, it is clear that cities and city regions will continue to be the focus of economic growth. Lord Heseltine's 'No Stone Unturned' report stated that: "Big government does not work. Ministers and their officials are not that clever. Events are not that predictable...

The challenge is to create a more balanced partnership – embracing the strengths of our cities and regions, and the resources of government."** Lord Heseltine suggested that resources for broadband were a key element in the 'single pot' he proposed for growth and regeneration.

The future for our cities

At a time when central support for local government is being cut significantly, councils will find that economic growth will be one of the few ways they can generate additional resources. Cities will find themselves not only having to enhance their own economies, but doing so in competition with others.

Councils and their leaders will have to go further in the years ahead in their attempts to lead growth. The reform to local authority funding from April 2013, coupled with the 'New Homes Bonus', will allow councils to generate additional resources by delivering higher levels of council tax and business rate income. They will be able to do this by building up the council tax and non-domestic rate base.

For city leaders, all possible routes to economic growth will have to be taken. Investments in railways, roads, housing and regeneration schemes are being encouraged by the Treasury, though it is often hard to get major projects to a 'shovel-ready' stage. Improved broadband provision is undoubtedly seen as an element in the investment programme, though often it receives less prominence than, say, new rail or cultural assets.

* http://www.centreforcities.org.uk/assets/files/2012/12-02-07_Key_city_stats.pdf
** *No Stone Unturned in Pursuit of Growth*, Lord Heseltine of Thenford, paragraph 16

Cities will find themselves not only having to enhance their own economies, but doing so in competition with other cities. The reforms to local government funding, such as the challenge funding model, put cities in direct competition for resources. Of course, if all councils can act efficiently in leading growth, it is likely the wider economy will grow faster. But there can be no doubt that the coming years will see city leaders drawn ever-more into competitive positions. Broadband is one of the most attractive elements in a city's competitive offer. It can generally be delivered with lower-cost investment than many other kinds of infrastructure.

Regeneris' modelling work makes it possible to quantify the potential benefits to UK cities from investment in and constructive use of fibre broadband. The research suggests a wide range of likely impacts and that cities will be able to develop their use of new technology to enhance their economic prospects.

The **Internet economy** accounted for **8.3% of UK GDP**

based on latest OECD GDP figures and is set to grow to 12.4% by 2016, the highest current and predicted GDP contribution in the G-20

Competition as the catalyst

Future-proofing UK economic development

The likely gains to UK GDP that would result from widespread increases in the country's broadband speeds have been estimated to be as much as £18bn[2] per annum within four years of implementation.

What speeds a particular business would need in the future and the relevant benefits of different speeds is not clear. However a recent survey by the Federation of Small Businesses[3] shows current examples of a lack of adequate broadband speed and coverage, with 52 per cent of small businesses saying that they needed speeds of 24-100Mbps, and 40 per cent reporting that they want – and would pay more for – speeds of over 50Mbps[4]. As far as small businesses are concerned, they are already experiencing the disadvantages and inefficiencies of insufficient speed and coverage.

It is hard to equate the economic gains from upgrading the broadband network with those created by the shift from dial-up to ADSL broadband as online activity has been characterised by unexpected shifts in patterns of data usage. Ever-higher definition video content is now piped through data networks, and home media creation has increased rapidly. The technologies that brought us remote working now encompass the interview process[5], and will soon be used extensively in the provision of medical services, raising the prospect of Britain profiting internationally from its healthcare knowledge.

Metrics that compare the download speeds required to stream individual videos at home obscure the business reality of multiple staff members running several applications in parallel, many requiring data uploading as well as downloading, particularly with the accelerating trend towards using cloud-based technology.

If the UK is to remain competitive, effective access to the internet's global markets and software innovations will be essential, and we can expect that internet entrepreneurs will develop new products that take advantage of higher-speed data connections and their expanding international reach.

The importance of telecoms and digital infrastructure

Digital investment and the UK's economic future

The internet is so intimately interwoven into the way we now do business, that disentangling its unique role is challenging. By some estimates, the internet economy accounts for over 8 per cent of the UK's GDP, a figure expected to rise to over 12 per cent by 2016, contributing around £225 billion to the national economy[6]. This is already the highest share of any country in the G20, and now accounts for almost a quarter of UK economic growth[7].

So far, Britain's appetite for digital activity has withstood some of its infrastructure limitations. Yet a number of studies have linked superfast and mobile broadband to economic growth, and a Capital Economics report asserts that mobile technologies alone could add up to 0.5 per cent to GDP[9], with Regeneris estimating that the introduction of superfast broadband to a given area could result in an increase in annual Gross Value Added (GVA) of 0.3-0.5 per cent, as take-up and usage builds[10].

In an environment where policymakers are keenly focused on growth, neglecting the infrastructure underlying the UK's digital connectivity is irrational. In the Global Financial Centres Index, which compares the rationales for where financial firms locate themselves, the main concern regarding telecoms infrastructure was that it is 'taken for granted until it goes wrong'[11].

Reaping the rewards

In 2010, the UK government released refreshed plans for upgrading the nation's broadband network to deliver a universal minimum coverage of 2Mbps, and access for 90 per cent of households to 'super-speed' broadband of 24Mbps or higher by 2015[12].

It also announced plans for 'Super-Connected Cities'[13] with speeds of over 80Mbps, creating the Urban Broadband Fund, a £150m initiative designed to deliver ultra-speed broadband to 22 cities in two 'waves'[14]. The respective local authorities had to submit bids for the funding, and each needed to demonstrate a viable business case, showing how increased speeds will translate into economic activity on the ground.

The current UK "Umbrella" state aid clearance for Superfast broadband specifically excludes the SCCP funding, thus separate state aid approval will be required if this fund is to be used for direct infrastructure grants which is likely to significantly impact the timescales for delivery of the infrastructure elements of this programme. As a result the SCCP funds are, initially at least expected to be focussed on "Voucher" type scheme for SMEs to connect to existing infrastructure.

Local authorities need a multi-pronged strategy that covers:

- Undertaking to invest in the necessary infrastructure to mitigate against future competitive disadvantage.
- Extending the benefits of a 'city hub' to help stimulate growth and development within the wider county base
- Educating both business and public-sector users about the efficiency gains at hand.
- Formulating wider plans to encourage businesses that depend on high-speed data connections eg. start-ups, video production companies and financial services companies etc.
- Encouraging take-up of the new services. High demand from businesses, consumers and public sector agencies for new services makes the case far stronger and encourages further private sector investment.

An index of potential benefits from fibre broadband investment and use

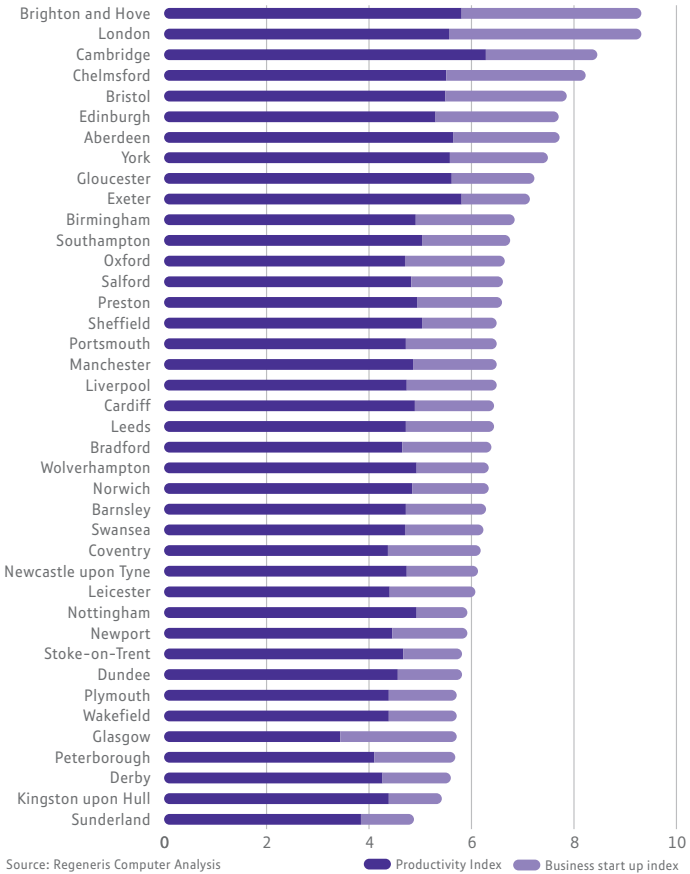
Regeneris' index of future fibre broadband potential provides an indication of the relative likely impact of superfast broadband in GB's cities. The overall scale of impact will primarily be driven by the size of city and its business base and economy. The index measures the potential impact on a city's business base. It excludes the potential benefits to residents in their domestic use of fibre broadband, and the role it might play in the delivery of public sector services.

The index measures the potential relative impact on city competitiveness of a 100 per cent roll out of fibre broadband across the city. It measures the gross effect of the full rollout of fibre broadband across a city, but does not assess the extent to which this has already taken place or is planned. The research focuses on the impact in a year when the benefits from 100 per cent rollout have fully accumulated.

Index of Fibre Broadband Potential in GB Cities

The Index suggests that the overall impact on productivity and business start-ups taken together, is expected to be greatest in Brighton, Cambridge, Chelmsford, Bristol, Edinburgh and London. Cities towards the bottom of the table need to change their economic offer if they want to benefit as much as those nearer the top, though some of these places have relatively large manufacturing bases and may be less reliant on the development of new sectors. However, the significant differences in development potential revealed by the economic analysis is sufficient to provide evidence of a need for greater civic skill in approaching the benefits of broadband investment.

Index of Fibre Broadband Potential in GB Cities



Source: Regeneris Computer Analysis

New technologies tend to produce greater returns where conditions consistently encourage relevant economic development. The index suggests that cities with modern and expanding economic bases are more likely to experience benefits from investment in technology. Nevertheless, all of the areas considered are shown to benefit from new investments. British towns and cities face competition not just from each other but from cities in other countries who may have the advantage of being able to devote significant resources to improving their broadband networks.

For cities in the Regeneris index that are shown as likely to face a less positive future, their leaders will have to think carefully about how best to improve economic performance, possibly by consistent policy towards new sectors based on broadband investment. If they do not they may find that other centres – particularly those that do not share similar state aid constraints – will continue to grow faster in the longer-term.

The Role of Broadband

Cities should view broadband both as an important infrastructure to facilitate their economic development, and as a signal of their willingness to embrace innovation. As the UK economy rebuilds in the wake of the 2008-2010 economic crisis, it needs to establish businesses that can survive in the challenging conditions that lie ahead. Companies that can access and use fibre broadband and other advanced technologies are likely to be an important part of the mix in this 'new' new economy.

Regeneris has also undertaken three key case studies.

City Case Studies

Regeneris has selected a city region for England, and one city each in Wales and Scotland, to represent the kinds of impacts that might be expected from broadband investment in other major urban centres. Although no one city can be fully representative, each provides evidence about how city economies are developing and how broadband might help.

The estimated costs from Regeneris identified in the case studies for providing fibre to 100 percent of homes and businesses in a city rely upon, but do not include, the existing private sector investment and deployment of infrastructure already taking place e.g. BT's £2.5 billion roll-out of fibre broadband to around two-thirds of the UK by the end of Spring 2014.

1. Leeds

Leeds city region is one of the largest in the UK outside London, and is home to about three million residents, 1.3 million jobs and over 95,000 businesses. The local economy generates over £53 billion annually – four per cent of the UK total – and represents 58 per cent of all businesses in the Yorkshire and Humberside economy.

Financial and business services are strong in Leeds, and contribute to a more balanced economy than many other large cities in Britain. Although 'professional, scientific and technical' activities are slightly under-represented in the Leeds city region, they have grown strongly in the period 2008-11, while others have contracted. 'Transport and storage' has also grown during the same period.

'The Leeds City Region Local Enterprise Partnership Plan 2012' identified several priority sectors for the future of the local economy:

- Life sciences, healthcare, medical
- Digital and creative industries
- Low carbon industries
- Advanced manufacturing
- Financial and business services

The City Deal agreed between Leeds and the government in 2012 will give the city region more flexibility to invest and generate resources in line with these economic priorities. Ultra-fast broadband will be provided to over 16,000 businesses as part of the City Deal outputs.

The Regeneris report identifies that Leeds had already been successful – in conjunction with BT – in providing superfast broadband in many parts of the city region, and had published a 'Digital Infrastructure Strategy' in 2012. Leeds and Bradford have been awarded £14m from the Super Connected Cities initiative to extend connectivity in city centre locations.

Regeneris has modeled the costs and potential economic benefits of providing universal superfast broadband across the Leeds city region. Costs are estimated to be about £180m, while the benefits might amount to £2bn additional GVA over 15 years. The extra output would be generated by improved productivity and new business start-ups. Access to superfast broadband is projected to drive business creation and innovation.

Investment on this scale in broadband would compare with spending of £1bn over 10 years on transport in West Yorkshire or £131m over five years by the Homes and Communities Agency. Expenditure in superfast broadband is on a similar scale to other existing city region investments.

2. Cardiff

Cardiff is the largest city in Wales and the core of the south of the country's economy. It is home to over 7,500 businesses which employ almost 200,000 people. The city's GVA was £8.5bn in 2011, equivalent to 18 per cent of the Wales total.

The city has moved from its reliance on port and traditional industrial activities, to being the main centre of financial and business services in Wales. It has an above-average proportion of employment in knowledge-based industries, as well as having a cluster of 100 bioscience-related companies. Cardiff also has concentrations of media and retail employment. The city is active in promoting finance, business services and bioscience.

Regeneris shows Cardiff as having broadly half of its exchanges enabled with superfast broadband. The city council has been awarded £7m-£12m from the Urban Broadband Fund which will be used throughout the city with priority given to the most productive areas.

Modeling by Regeneris suggests it would cost about £20m to provide comprehensive coverage of superfast broadband across Cardiff. This investment could potentially generate up to £298m in GVA over 15 years, equivalent to just under £20m per annum. Most of the additional GVA would be generated by improved business performance, with perhaps 10 per cent of the gain attributable to new businesses.

Regeneris suggests that many of the existing financial and business services companies located in the city already have access to high capacity leased lines. The main beneficiaries in Cardiff are more likely to be a larger number of smaller professional services companies, such as lawyers, engineers and consultants. Regeneris' work suggests such companies can increase productivity by as much as 20 per cent as the result of fast broadband.

Investment of £20m in superfast broadband would probably be spread over four years. In comparison, Cardiff City Council invested just under £16m in transport infrastructure in 2011-2012. Spending on affordable housing in Cardiff was £12m in 2011-2012. Future road-building is expected to cost up to half a billion pounds. Spending £20m on broadband improvements would be substantial, but would only represent a small proportion of overall investment. Water, gas and electricity infrastructure investment is also likely to be significant in the coming years as elderly assets are replaced.

3. Aberdeen

Aberdeen is Scotland's third city, with a population of 220,000. The wider Aberdeen and Aberdeenshire population was about 470,000 in 2012. The area has benefited enormously in recent decades because of the city's energy industry. The Aberdeen and Aberdeenshire economy generated £15bn of GVA in 2011. The GVA per head figure, £32,000, is one of the highest in the UK outside London.

The area is home to 7,000 businesses which employ 178,000 people. The 22,000 employed in the petroleum industry represent half of the total for Britain. The city has plans to market its knowledge and expertise to the off-shore energy industry internationally as a part of reinventing itself as a hub for research, development and innovation. There has also been a drive to develop the renewable energy industry in the city as part of a policy to establish the area as a home to all types of energy expertise.

The public-private sector partnership Aberdeen City and Shire Economic Future (ACSEF) has actively promoted improved broadband for residents and businesses as part of a policy to incentivise energy-related companies to locate in the area. ACSEF has received £20m in funding from Aberdeen and Aberdeenshire councils towards superfast broadband coverage. The partnership has also been successful in bidding for Super Connected Cities funding, and there are plans for a next generation wireless network in the City of Aberdeen.

Regeneris has modeled the potential costs and benefits of providing universal superfast broadband across Aberdeen. Costs are estimated to be about £15m, while the benefits might amount to £313m additional GVA over 15 years, about £21m per year. At its peak, the annual GVA increase might be over £26m. The additional economic output would be generated by higher productivity and increased business start-ups.

Investment of £15m in broadband over four years would compare with spending plans for Aberdeen and Aberdeenshire of £1bn on transport projects over the period 2013-2018, with the bulk of the money for road-building. In addition, it is projected that expenditure on investment in energy projects could be £300m over five years. By contrast, the investments required for broadband improvements are relatively modest.

Conclusions

Widespread access to faster broadband will be critical for the continued growth of the UK's internet economy. Policymakers must choose whether the UK benefits from an infrastructure that helps cities stay ahead of the curve, or suffers the competitive disadvantage entailed by playing catch-up.

Speed alone will not bring the promised economic benefits – these involve a wider agenda of ensuring that those in need of the speed actually have access to it, and that everybody - in both the private and public sectors – understands the efficiency benefits that the latest technologies can bring to both small and complex organisations.

City governments will want to consider these issues from the point of view of both local and international competition.

Local considerations

At the local level, the first hurdle involves competing with other cities for resources from the Urban Broadband Fund. The city must create the conditions that will attract businesses already in need of high speed data connections, as well as stimulate new business creation. In most cases, these activities should already be firmly on city economic development agendas.

Rolling out these measures will provide the UK with an immediate employment boost, creating jobs in the extension of the network. For cities that are projected to grow least as a result of fibre broadband investments, there is an opportunity to catch up with the better performers. But this will require innovation and increased effort, including a need to be proactive in demand stimulation, particularly in relation to the encouragement of new start-up businesses. In some places, for example the Tech City cluster in Shoreditch, growth has occurred naturally, but in others it will be necessary to provide incentives and an improved environment.

International opportunities

For early movers, the international landscape provides great opportunity. Some commentators observe that improved voice and video services will facilitate outsourcing of jobs abroad, but this is a process that can cut both ways. British cities and their companies can hold on to, and attract back, business from overseas.

The gradual evolution of live video communication from a mediocre experience to a reliable service that can supplant the need for international trips makes it easy to maintain good two-way communications between organisations that have the necessary infrastructure.

For a country with so many knowledge-based activities – consultancies in the service industry, world-class academic institutions, and the embedded expertise of public service bodies such as the NHS - the ability to offer tailored expertise to a global market is ripe with potential, and local government should pay special attention to the service needs of those countries leading the connection speed tables.

A wider strategy

Any move to implement high-speed broadband cannot be effective alone, and should form part of a wider, integrated local strategy. Without appropriate training, awareness and availability of coverage, the physical infrastructure remains a necessary, but not a sufficient, condition for tapping the potential benefits that fibre broadband offers.

The opportunity for city government

City governments can use fibre broadband as part of their wider strategy to redevelop and strengthen local economies. This is not a 'zero-sum' competitive opportunity. If all - or most - cities were able to make fibre broadband investments in parallel, it would be possible for all of them to rise together to the greater benefit of the country as a whole.

When looked at from a 'whole city economy' perspective, the case for investing in fibre broadband is powerful. The case studies demonstrate that a city-wide partnership approach to new infrastructure investment will create GVA benefits that simply cannot be derived from smaller-scale interventions or piecemeal service provision.

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Appendices

Leeds City Region Case Study

Headlines

- The roll out of superfast broadband to all exchanges and cabinets in the Leeds City Region could generate an additional £2 billion in GVA over 15 years (around £130m annually) across the local economy.
- The increase in GVA is equivalent to an annual increase of 0.2% GVA per annum over the next 15 years

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Introduction

This case study presents an assessment of the potential impact of BT's roll-out of superfast broadband in the Leeds City Region. It forms part of a wider study by Professor Tony Travers and Regeneris Consulting, assessing the role and contribution of SFB to the economic growth of UK cities. The case study looks at the following:

- The recent performance of the city region's economy and the key sectors expected to drive growth in the future;
- The scale of investment in superfast broadband being made by BT in the city region and how this compares to other infrastructure investment, such as housing and transport;
- The scale of the potential economic impact from BT's investment in superfast broadband, and the specific sectors which could benefit most.

Context

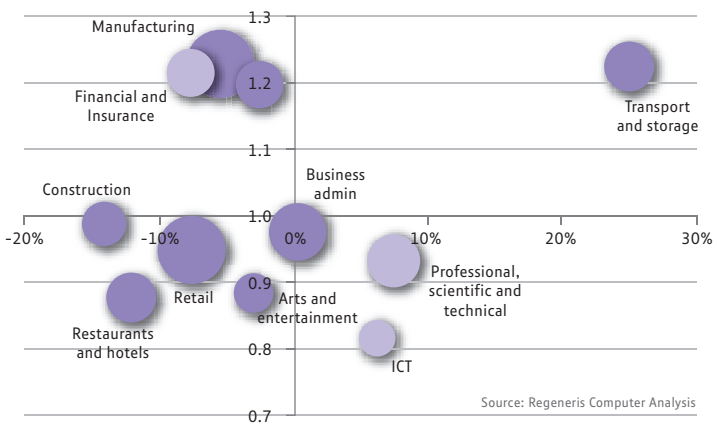
The Leeds City Region (LCR)'s ten local authority districts[1] form one of the largest and most dynamic economic areas in the North of England. The city region is home to almost three million residents, 1.3 million jobs and over 95,000 businesses. LCR makes a considerable contribution to the national economy, generating over £53 billion GVA annually (4% of the UK total) and is the major driver of the Yorkshire and Humber economy, accounting for 58% of businesses in the region.

The LCR has a diverse economy and a number of growing knowledge based sectors. LCR's financial services sector is the largest outside London, accounting for 60,000 jobs (5% of employment).

1 Which are: Leeds, Bradford, Kirklees, Calderdale, Wakefield, Barnsley, Selby, Harrogate, York and Craven

Other knowledge based industries, such as professional, scientific and technical activities and ICT are less established in LCR than the national average. However these sectors have continued to show strong rates of growth since the economic downturn, while other sectors have contracted. Overall, knowledge based industries account for 15% of employment in the City Region and 29% of the business base, compared to 15% and 27% in Great Britain as a whole.

Figure 1-1: Performance of Key Sectors in Leeds City Region, 2008-2011 (Private Sector Only)



Note: Size of bubbles indicates scale of total employment. Knowledge based sectors are shown in lighter shade. Location Quotient measures the concentration of employment in a sector relative to the average for Great Britain. A location quotient above 1 indicates that a sector accounts for a higher share of total employment than the average.

Source: Business Register and Employment Survey via Nomis

The Leeds City Region has identified a number of priority sectors[2], which have the potential to drive growth in LCR over the next ten to fifteen years. These include:

- **Life sciences and related industries,** particularly healthcare and medical technologies
- **Digital and creative industries,** particularly tele-health, printable electronics and creative content
- **Low carbon industries,** particularly manufacturing of environmental technologies, renewable energy and green construction
- **Advanced manufacturing,** particularly industrial biotechnology and engineering
- **Financial and business services,** particularly major building societies and the full range of service to business

In July 2012, LCR agreed a City Deal with Government to boost jobs and growth in the City Region. The City Deal will give Leeds and its partner councils greater controls over spending and decision making to ensure interventions are in line with the needs of the city-region economy. The agreement includes a £1 billion fund to improve public transport, targeted support to increase the number of apprenticeships, as well as funding to provide ultra-fast broadband to over 16,000 businesses.

A further measure agreed with government to support growth has been the selection of Aire Valley, to the east of Leeds city centre, as a site for one of the UK's enterprise zones (EZ). The government has introduced enterprise zones to stimulate private sector investment and drive economic growth, backed by incentives which include reduced business rates, simplified planning regulations and access to superfast broadband.

Broadband Context

The Leeds City Region recognised the importance of superfast broadband to economic growth in its Digital Infrastructure Strategy, 2012. This document sets out the strategic priorities which need to be addressed for the city region to fully exploit the social and economic benefits of superfast broadband. The strategy sets ambitious targets for providing superfast or ultrafast broadband in key business locations by 2020[3].

Superfast broadband is already widely available across the Leeds City Region due to past investment by BT. Of the 175 exchanges in the city region, 145 have been, or will be, connected to the fibre network by the end of 2014, representing 83% of exchanges[4].

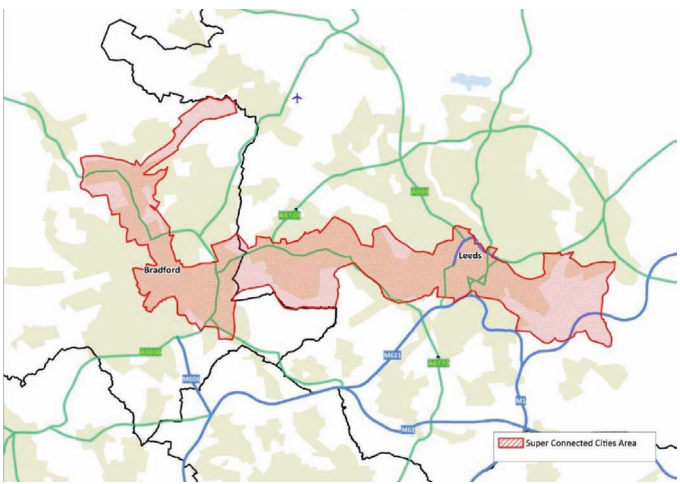
2 Source: Leeds City Region Local Enterprise Partnership Plan, 2012

3 Superfast broadband is generally taken to mean download speeds in excess of 30Mbps and ultra-fast broadband is generally taken to mean download speeds of more than 80Mbps.

4 Although these exchanges have been upgraded, not all premises will be able to access superfast broadband, as some cabinets will not be upgraded and some premises are connected via exchange only lines.

In addition to BT's roll out, Leeds and Bradford have been awarded £14m funding from the Government's Super Connected Cities initiative, to make ultra-fast broadband available in city centre locations. Leeds/Bradford's current proposals reflect the priorities set out in the Digital Infrastructure Plan; to cover the main business locations in each of the city centres with fibre to the premise (FTTP) and provide universal coverage of superfast broadband in the corridor linking the two cities. There are also plans to make high speed wireless broadband widely available in both city centres.

Figure 1-2: The Super Connected Cities intervention area for Leeds/Bradford



Source: Leeds City Council

In addition to the roll out of superfast broadband, BT generates considerable economic benefits for the Leeds City Region economy. A 2012 report by Regeneris Consulting found that the BT group's activities supported 11,200 jobs and over £600 million in GVA in the City Region. This figure includes the direct effect of BT employing people in the region, as well as the wider indirect and induced benefits generated through BT's supply chain and the expenditure of employees in the local economy. BT's economic impact was particularly high in certain sectors of the economy; the report found that one in eight employees in the IT and telecommunications sector in LCR was directly employed by BT.

Key Results

Regeneris has modelled the potential economic impacts of providing 100% access to superfast broadband across the Leeds City Region. The costs of providing universal coverage across LCR have been estimated to be between £160m and £200m[5]. This cost includes all existing enabled exchanges and those which have yet to receive superfast broadband.

The investment in the Leeds City Region could potentially generate up to an additional £2bn in GVA over 15 years. This would be made up of the following:

- £1.8bn in productivity improvements benefits
- £0.2bn through new business start-ups benefits.

5 This figure uses benchmarks for BT's overall investment in FTTC in the UK and applies this to the number of premises in the Leeds City Region. The cost works out at between £120 and £150 per premise passed. This was then multiplied by the total number of premises in the LCR (1.33m) to get the overall investment range of £160m to £200m

By the year of maximum impact the annual value of GVA improvements across the LCR would be around £174m p.a. This represents around a 0.3% increase in the current levels of GVA.

The modelling of economic impacts can only be indicative as it is impossible to be sure what the rate of take-up will be and how far businesses use SFB to drive and support productivity improvements. It is important to note that these estimates probably represent the upper-end of the impact of SFB in the area on private sector SMEs[6] for two reasons: first they assume 100% take up of SFB by SMEs in those parts of the economy that stand to benefit; second they assume that the past evidence on the business GVA uplift from the introduction of broadband via ISDN is fully translated to this next generation of broadband investment. In practice it is possible that some diminishing returns may set in. If take-up by SMEs of SFB were only to reach 35%, as some estimates have modelled, then the overall benefits would only be around a third of those estimated above; although a cumulative increase in GVA of the order of £700m would still represent a substantial boost to the city region.

Our modelling work focuses on the potential impact of Fibre Broadband for SMEs in the private sector. It does not take account of the full range of potential benefits that could occur to the economy and society in cities. For instance, there are likely to be productivity benefits and service improvements in the public sector as a result of widespread access personal to Fibre Broadband (such as tele-medicine and tele-education). The estimates also do not take account of the welfare and other benefits for households as a result of access to Fibre Broadband. Finally, the modelling assumes that all large, non-SME firms have realised or will realise the potential productivity improvements from better bandwidth in the absence of the full roll-out of Fibre Broadband in cities. In practice, their ability to realise these benefits may be aided by Fibre Broadband roll-out (especially as customers and suppliers have access to better connectivity).

The sectors which would benefit most from the roll-out of superfast broadband include many of those identified as key sources of future economic growth by the Leeds City Region LEP. Sectors such as life sciences, biotechnology and printable electronics rely heavily on R&D and collaborative working between SMEs to drive the innovation process and increase productivity. Accessing superfast broadband will increase the capacity of SMEs to share research and collaborate, and could therefore lead to increased rates of innovation in the sector.

The potential opportunities are also significant for the Leeds City Region's creative and digital sector; another priority for the LEP. This sector is populated by small, flexible and talented entrepreneurs who also rely on the sharing of ideas and uploading new content. As broadband penetration increases and new applications proliferate, there will be a growing number of opportunities for these businesses to access new markets.

6 Small and Medium Enterprises, defined as firms with fewer than 250 employees and not part of a bigger group

Comparing to Other Investments

The investment of £160m to £200m in superfast broadband which is likely to be spread over 5 years (between £32m and £40m p.a.) can be compared to some of the other infrastructure investments proposed in the city region:

- Leeds's City Deal with Government in July 2012 set out its plans to invest £1 billion in transport over ten years through the West Yorkshire Plus Transport Fund over 10 years (£100m p.a.), significantly more than the estimated investment in SFB. They estimate that the transport investment could generate significant economic benefits; employment and GVA would grow year on year from the start of the Fund's delivery programme such that by 2026, there would be an additional 20,000 new jobs and additional GVA of £1.5 billion per year in West Yorkshire.
- Leeds City Council's Capital Programme provides detail of some of the specific transport investments being made in the city. It shows total capital investment in the highways network of around £30m per annum between 2011/12 and 2014/15, although this relates only to Leeds City Council. Total capital investment in other forms of transport is more modest (at around £4m per annum).
- The SFB investment is of the same order of magnitude as total planned investment by the Homes and Communities Agency (HCA) in the areas. The Leeds City Region's Housing Investment Plan estimates total HCA investment of £131m over the period 2010-2014 (or around £32m pa). This will deliver 4,400 new homes, 1,000 of which will be affordable. However a key element of delivery of the Investment Plan will be to unlock sites in preparation for development. It is estimated the investment will facilitate the development of over 60,000 properties and the reclamation of large areas of brownfield land.

Infrastructure Type	Purpose of investment	Investment per annum
Broadband	100% roll out of fibre broadband	£32-40m
Transport	West Yorkshire Plus Transport Fund	£100m
Transport	Investment in highways network	£30m*
Transport	Investment in public transport	£4m*
Housing	Delivery of 4,400 new homes and land reclamation	£32m

* applies to Leeds City Council area only

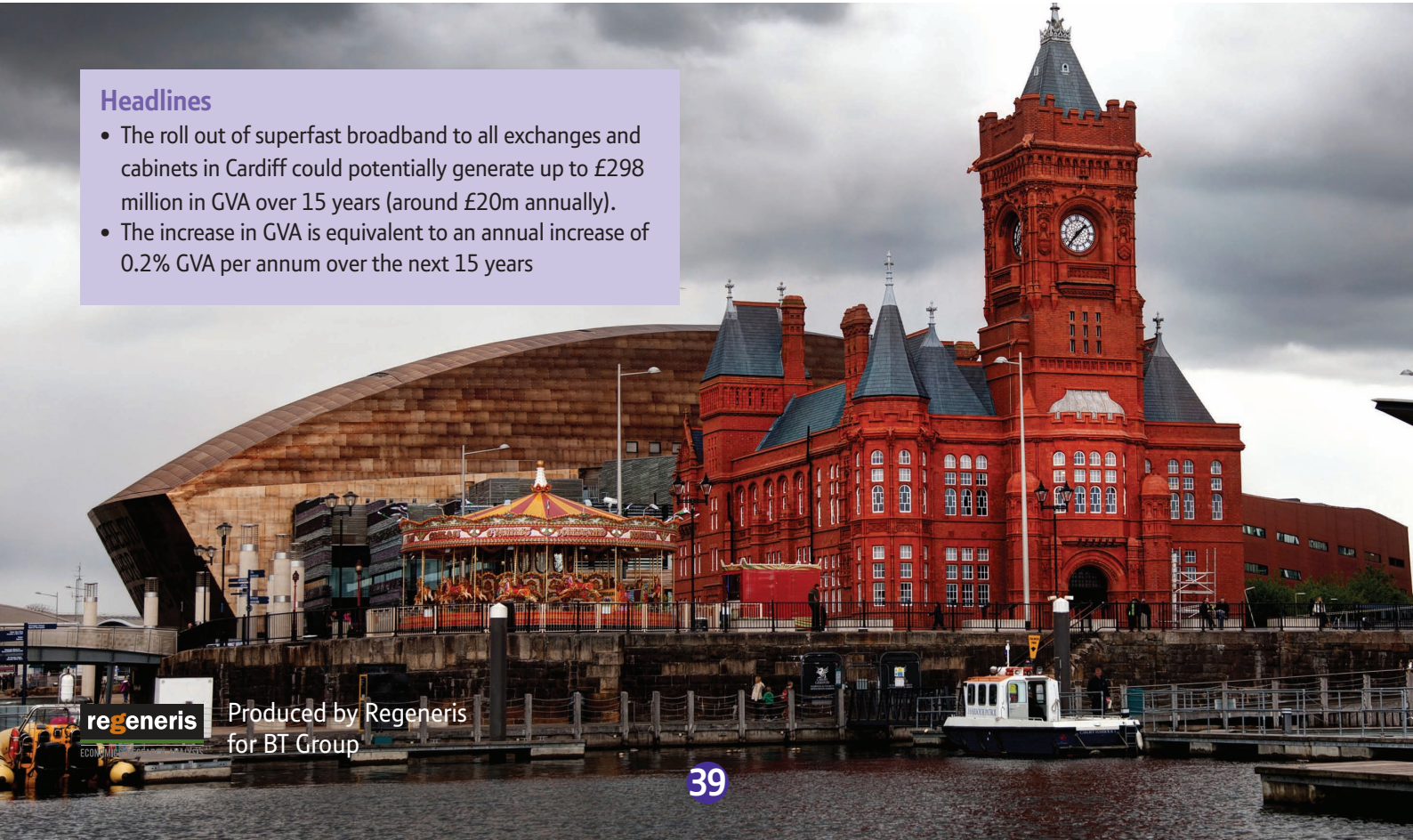
Concluding Comments

The Leeds City Region is one of the largest economies in the North of England and home to a number of fast growing knowledge based sectors. There is an expectation that it will continue to be a key driver of growth over the next ten years, but partners will need to achieve this with far less resources than they did in the past. The recent changes to economic development funding, such as the City Deals, gives cities such as Leeds greater powers to influence growth and also provides them with greater incentives to select investments which will maximise economic returns for their area.

The total investment in broadband is relatively modest when compared to some of the other investments in infrastructure being made in LCR, but could be delivered at a much quicker pace. Indeed, much of the investment to connect businesses to Fibre Broadband in LCR has already taken place. The one-off investment will also provide the city region with a future proofed digital infrastructure, which is increasingly seen by business as a key element in a city's competitive offer. This is especially the case for some of the sectors which have been identified by LCR as being critical to future economic growth, such as life sciences and digital and creative industries.

While the roll out of publicly funded ultra-fast broadband will be focused on the city centres of Leeds and Bradford, the LCR will also need to consider how to maximise the economic benefits across the whole city region. There are 95,000 businesses in LCR, many of which are located in rural or semi-rural locations; particularly in the north and west of the city region. These businesses stand to benefit from fibre broadband through the increased flexibility it offers, however their awareness of its benefits may be low. The investment will therefore need to be accompanied by other interventions which raise demand for Fibre Broadband and ensure businesses fully exploit its potential.

Cardiff City Case Study



Headlines

- The roll out of superfast broadband to all exchanges and cabinets in Cardiff could potentially generate up to £298 million in GVA over 15 years (around £20m annually).
- The increase in GVA is equivalent to an annual increase of 0.2% GVA per annum over the next 15 years

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Produced by Regeneris for BT Group

Introduction

This case study presents an assessment of the potential impact of BT's roll-out of superfast broadband in Cardiff. It forms part of a wider study by Professor Tony Travers and Regeneris Consulting, assessing the role and contribution of SFB to the economic growth of UK cities. The case study looks at the following:

- The recent performance of Cardiff's economy and the key sectors expected to drive growth in the future;
- The scale of investment in superfast broadband being made by BT in Cardiff and how this compares to other infrastructure investment in the city, such as housing and transport;
- The scale of the potential economic impact from BT's investment in superfast broadband, and the specific sectors which could benefit most.

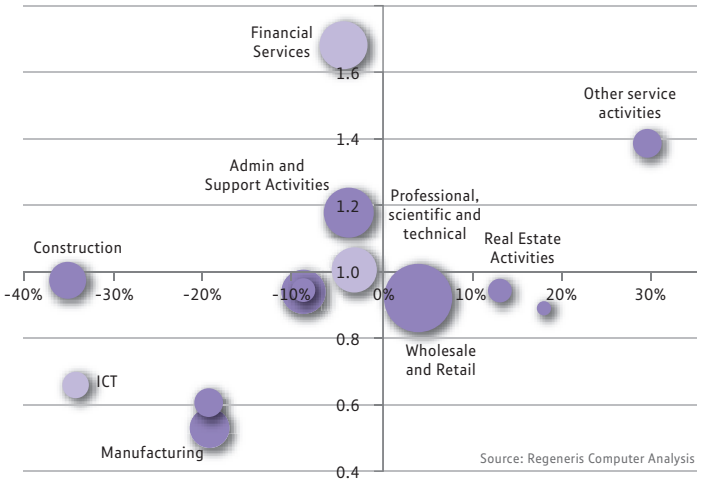
Context

As the capital city of Wales, Cardiff is the main engine of growth in the Welsh economy. The city is home to over 7,500 businesses, employing 197,000 people. The city generated £8.5 billion in GVA in 2011, accounting for 18% of the total GVA for Wales. The economy experienced a significant fall in employment following the economic downturn, decreasing by 6,000 jobs, or 3%, between 2008 and 2009.

Originally a port city, Cardiff has transformed its economy into a modern and competitive knowledge based economy in recent years. Cardiff is the principal finance and business services centre in Wales, and as such there is a strong representation of finance and professional services in the local economy, accounting for 27,000 jobs or 14% of total employment, compared to 11% in Great Britain as a whole. The strong performance of this sector explains the above average number of people employed in knowledge based industries (16%).

The city is home to a cluster of around 100 bioscience related companies and organisations, and also has a concentration of media employment. At present, these are small and developing sectors. However they are identified by Cardiff City Council as opportunities for growth in the future.

Figure 2-1: Performance of Key Sectors in Cardiff, 2008-2011 (Private Sector Only)



Note: Size of bubbles indicates scale of total employment. Knowledge based sectors are shown in lighter shade. Location Quotient measures the concentration of employment in a sector relative to the average for Great Britain. A location quotient above 1 indicates that a sector accounts for a higher share of total employment than the average.

Source: Business Register and Employment Survey via Nomis

Cardiff has also been announced as the location for an Enterprise Zone. The EZ will be located in the heart of the city centre and will provide 600,000 sq. ft. of office space in a new Central Business District. The EZ will be targeted primarily at financial and professional services, given the city's established appeal to businesses in these sectors.

Broadband Context

There are 11 BT exchanges across the Cardiff local authority area. Of these, nine have already been enabled with superfast broadband and a further one will be upgraded during 2014 as part of the BDUK Wales partnership project.

Cardiff City Council has also been awarded a minimum of £7m through the Urban Broadband Fund (with a potential maximum award of £12m). The scope of the Cardiff project will include the whole area of Cardiff except the Creigiau and Pentyrch Electoral Districts. These districts are covered under the 'Superfast Cymru' project which is being run by the Welsh Government.

Key Results

The costs of providing universal coverage across Cardiff have been estimated by Regeneris to be between £18m and £22m[7]. This cost includes all existing enabled exchanges and those which have yet to receive superfast broadband.

Regeneris's impact modelling estimates that the investment could potentially generate up to £298m in GVA over 15 years (around £19.9m annually). This is equivalent to an annual increase in GVA of around 0.2% per annum. This would be made up of the following:

- £272m created through improved business performance
- £26m through new business start ups

7 This figure uses benchmarks for BT's overall investment in FTTC in the UK and applies this to the number of premises in Cardiff. The cost works out at between £120 and £150 per premise passed. This was then multiplied by the total number of premises in Cardiff (148,000) to get the overall investment range of £18m and £22m.

By the year of maximum impact the annual value of GVA improvements across Cardiff would be around £24.8m pa. This represents around a 0.3% increase in the current levels of GVA.

The modelling of economic impacts can only be indicative as it is impossible to be sure what the rate of take-up will be and how far businesses use SFB to drive and support productivity improvements. It is important to note that these estimates probably represent the upper-end of the impact of SFB for private sector SMEs in the area for two reasons: first they assume 100% take up of SFB by SMEs in those parts of the economy that stand to benefit; second they assume that the past evidence on the business GVA uplift from the introduction of broadband via ISDN is fully translated to this next generation of broadband investment. In practice it is possible that some diminishing returns may set in. If take-up by SMEs of SFB were only to reach 35%, as some estimates have modelled, then the overall benefits would only be around a third of those estimated above; although a cumulative increase in GVA of the order of £104m would still represent a substantial boost to the city.

Our modelling work focuses on the potential impact of Fibre Broadband for SMEs in the private sector. It does not take account of the full range of potential benefits that could occur to the economy and society in cities. For instance, there are likely to be productivity benefits and service improvements in the public sector as a result of widespread access personal to Fibre Broadband (such as tele-medicine and tele-education). The estimates also do not take account of the welfare and other benefits for households as a result of access to Fibre Broadband. Finally, the modelling assumes that all large, non-SME firms have realised or will realise the potential productivity improvements from better bandwidth through alternative technologies, (e.g. Ethernet or Leased Lines), in the absence of the full roll-out of Fibre Broadband in cities. In practice, their ability to realise these benefits may be aided by Fibre Broadband roll-out (especially as customers and suppliers have access to better connectivity).

The major sector in the city of Cardiff is financial services, and the sector is dominated by a number of large globally recognised financial services companies. While these companies will generate significant benefits from adopting superfast broadband, they are unlikely to be affected by the roll out of the fibre network, since most of these companies will arrange their own high capacity leased lines.

The city's professional services sector may be better placed to exploit the opportunities offered through superfast broadband since this sector tends to be made up of a larger number of small businesses, including concentrations of solicitors, consultancy and engineering firms. The benefits of superfast broadband for these sectors include lower capital costs for ICT infrastructure, through use of cloud computing, which could increase start up rates, and enhanced capacity to communicate with clients and collaborators. These sectors could also achieve greater productivity through adopting more flexible working practices, such as increased home working, which studies show can increase productivity by up to 20%[8].

8 http://www.ictknowledgebase.org.uk/remoteworkinghenefits?type=98

Comparing to Other Investments

The investment of £18-22m in superfast broadband, which is likely to be spread over four years (or around £5m/year) can be compared to some of the other infrastructure investments in the city region:

- The annual investment in SFB is significantly lower than the capital investment in transport in Cardiff. Data for capital expenditure of Welsh local authorities shows that Cardiff City Council invested £15.9m in transport infrastructure in 2011/12, with over 80% of this invested in roads and street lighting[9].
- The investment in broadband would also be considerably lower than the £12m in capital investment in affordable housing in Cardiff in 2011/12[10].
- The £19.7m investment in superfast broadband is limited in scale when compared to the ambitious plans set out in Cardiff's Local Development Plan Preferred Strategy for a significant expansion of the city's housing. The project will see 45,400 new homes built by 2026. As part of the plan, Cardiff Council will also invest heavily in infrastructure investment, including the funding of two new dual carriageways in Cardiff - at the estimated cost of up to half a billion pounds.

Infrastructure Type	Purpose of investment	Investment per annum
Broadband	100% roll out of fibre broadband	£4.5 to £5.5m
Transport	Investment in new roads and street lighting	£12.7m
Housing	Provision of affordable housing	£12m

9 http://wales.gov.uk/docs/statistics/2012/121010sdr1662012en.pdf

Concluding Comments

Cardiff is the capital city and largest economy of Wales. In the last fifteen years it has overseen a transformation in economic fortunes, managing the decline in key sectors to become an established centre for financial and professional services. Looking to the future, Cardiff City Council have set out ambitious growth plans for the city, with an additional 45,000 new homes planned by 2026 and the stated aim of driving a shift from consumption to production, and developing a reputation as a business city.

The Council recognise that the transition to becoming a high quality business location will "need to be underpinned by substantial investments in business infrastructure, with 'connectivity,' both physical and virtual", identified as a key priority. Set alongside the other planned investments in infrastructure, the annual outlay of £5m for ubiquitous access to faster broadband is relatively modest.

The major benefits to Cardiff are likely to be in the city's professional services sector, which is made up of smaller companies servicing the established larger businesses in the financial services sector. The entrepreneurs and small firms who make up the city's developing creative and digital sector will also secure significant benefits from the roll out of fibre. These firms are already being targeted by the City Council through the creation of a new innovation centre for young companies, comprising 50,000 sq. ft. of low cost incubation space. Investments such as these will help maximise the potential economic benefits from broadband, such as increased rates of innovation and new business start-ups.

10 Total investment in housing was £34.6m, however a significant proportion of this was for the Housing Revenue Account.

Aberdeen City Case Study

Headlines

- The roll out of superfast broadband to all exchanges and cabinets in Aberdeen could potentially generate up to £313 million in GVA over 15 years (around £20.9m annually).
- The increase in GVA is equivalent to an annual increase of 0.2% GVA per annum over the next 15 years

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Introduction

This case study presents an assessment of the potential impact of BT's roll-out of superfast broadband in the city of Aberdeen. It forms part of a wider study by Professor Tony Travers and Regeneris Consulting, assessing the role and contribution of SFB to the economic growth of UK cities. The case study looks at the following:

- The recent performance of the Aberdeen's economy and the key sectors expected to drive growth in the future;
- The scale of investment in superfast broadband being made by BT in the city and how this compares to other infrastructure investment, such as housing and transport;
- The scale of the potential economic impact from BT's investment in superfast broadband, and the specific sectors which could benefit most.

Context

Aberdeen is one of the most prosperous cities in the UK and has undergone an economic boom in the last three decades, driven by the city's energy industry. The Aberdeen and Aberdeenshire economy generated £15 billion in GVA in 2011, and with an average GVA per capita of £32,000, it is one of the most productive cities in the UK outside London.

Aberdeen is home to 7,000 businesses, employing 178,000 people. The petroleum sector accounts directly for 22,000 direct jobs (half of the total for Great Britain). However the total contribution of the sector is much wider as a result of the supply chain which supports the industry. This supply chain is large in scale and covers a wide range of knowledge intensive sectors, including consultancy, engineering, human resources, legal, finance and research. The growth of Aberdeen's off-shore energy industry has been a strong incentive for firms in these sectors to locate in the city, and today, knowledge based industries account for 42% of all businesses.

While oil reserves are still flowing, it is estimated that North Sea oil is nearing or has surpassed its peak production rate. However, the public-private sector partnership Aberdeen City and Shire Economic Future (ACSEF) still sees the oil industry as playing a central role in the future growth of the city. Rather than offshore drilling, however, the city will be marketing its knowledge and expertise to the oil industry around the world, reinventing itself as a global R&D and innovation hub.

There has also been a significant driven to develop the renewable energy industry in the city in recent years, with a number of planned investments that would allow manufacturers of wind turbines and other equipment to develop and test new designs in Aberdeen. In time, it is hoped that the city will have established itself as a centre of excellence across all energy types, and will have facilitated a transfer of skills and employment from fossil fuels to renewables.

Broadband Context

There are 12 BT exchanges across the Aberdeen local authority area. Of these, seven have already been enabled with superfast broadband, giving total coverage of 58% of exchanges.

ACSEF has taken a pro-active stance on delivering improved broadband for residents and businesses, which it sees as key to providing further incentives for energy related companies to locate in the city. The public-private partnership has developed a Regional Broadband Plan to deliver a world-class infrastructure for the North East of Scotland.

ACSEF has secured £20m funding from Aberdeen City and Shire Councils as a contribution towards delivery of the plan, and has been successful in its bid for super-connected cities funding. The value of the SCC bid has yet to be confirmed, but will be used to make ultra-fast broadband widely available in the city and to fund an open access fibre network running around the western periphery of the city to enhance coverage of major residential and industrial developments. ACSEF also plan to deploy a next generation wireless network in Aberdeen City utilising its existing property portfolio as an incentive for wireless operators to deploy base stations across the City.

Key Results

The costs of providing universal coverage across Aberdeen have been estimated by Regeneris to be between £13m and £16m[11]. This cost includes all existing enabled exchanges and those which have yet to receive superfast broadband.

Regeneris's modelling estimates that the investment could potentially generate up to £313m in GVA over 15 years (around £20.9m annually). This is equivalent to an annual increase in GVA of around 0.2% per annum. This would be made up of the following:

- £284m created through improved business performance
- £29m through new business start-ups,

By the year of maximum impact the annual value of GVA improvements across Aberdeen would be around £26.6m pa. This represents around a 0.3% increase in the current levels of GVA.

The modelling of economic impacts can only be indicative as it is impossible to be sure what the rate of take-up will be and how far businesses use SFB to drive and support productivity improvements. It is important to note that these estimates probably represent the upper-end of the impact of SFB on private sector SMEs in the area for two reasons: first they assume 100% take up of SFB by SMEs in those parts of the economy that stand to benefit; second they assume that the past evidence on the business GVA uplift from the introduction of broadband via ISDN is fully translated to this next generation of broadband investment. In practice it is possible that some diminishing returns may set in. If take-up by SMEs of SFB were only to reach 35%, as some estimates have modelled, then the overall benefits would only be around a third of those estimated above; although a cumulative increase in GVA of the order of £110m would still represent a substantial boost to the city.

Our modelling work focuses on the potential impact of Fibre Broadband for SMEs in the private sector. It does not take account of the full range of potential benefits that could occur to the economy and society in cities. For instance, there are likely to be productivity benefits and service improvements in the public sector as a result of widespread access personal to Fibre Broadband (such as tele-medicine and tele-education). The estimates also do not take account of the welfare and other benefits for households as a result of access to Fibre Broadband. Finally, the modelling assumes that all large, non-SME firms have realised or will realise the potential productivity improvements from better bandwidth in the absence of the full roll-out of Fibre Broadband in cities. In practice, their ability to realise these benefits may be aided by Fibre Broadband roll-out (especially as customers and suppliers have access to better connectivity).

11 This figure uses benchmarks for BT's overall investment in FTTC in the UK and applies this to the number of premises in Aberdeen. The cost works out as on average between £120 and £150 per premise passed. This was then multiplied by the total number of premises in Aberdeen (108,000) to get the overall investment range of £13m and £16m.

ACSEF's objective of reinventing Aberdeen as a R&D and innovation hub for the energy industry could be supported by the availability of superfast and ultrafast broadband in the city. As the emphasis of the industry shifts from offshore drilling to exporting its knowledge and expertise, world class communication links will be extremely important for communicating with clients in other parts of the world, either through content sharing or videoconferencing. This is all the more important given Aberdeen's remote location, which makes it inaccessible even to clients in other parts of the UK.

Comparing to Other Investments

The investment of £13-£16m in fibre broadband, which is likely to be spread over four years (or around £3.25 to £4m per year) can be compared to some of the other infrastructure investments in the city region:

- The Economic Action Plan for Aberdeen City and Shire (2013-2018) sets out over £1 billion in public investment for transport projects. Of this, over £800m (£160m p.a.) is earmarked for road projects which would reduce congestion in the city itself. This includes construction of Aberdeen Western Peripheral Route and dualling of some roads in the city and represents an annual investment 40 times greater than the estimated investment in superfast broadband.
- The plan also allocates a much greater investment in energy projects than superfast broadband. It identifies a minimum investment of £300 million in energy projects over the next five years (£60m p.a.), including £230m (£46m p.a.) for the delivery of the European Offshore Wind Deployment Centre in Aberdeen City.

Infrastructure Type	Purpose of investment	Investment per annum
Broadband	100% roll out of fibre broadband	£3.25 to £4m
Transport	Road Projects in Aberdeen City and Shire	£160m
Energy	Delivery of European Offshore Wind Deployment Centre	£46m

Concluding Comments

Aberdeen is the centre for the UK's energy industry, a global centre for the sector and one of the most productive economies in the UK. While its success in the past was driven by access to North Sea oil reserves, its future success will lie in how it capitalises upon the skills and expertise of its businesses and residents, which can be marketed to other energy locations around the world. Whilst human capital is Aberdeen's key asset, the city's location in the north of Europe means that this knowledge can only be shared with clients if businesses have access to a world class telecommunications network. The sums being proposed for investment in other types of infrastructure dwarf those being invested in the fibre roll out in the city, and suggest that these benefits could be secured through a relatively modest outlay.

Index of Fibre Broadband Potential

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This appendix summarises the work carried out for BT by Regeneris Consulting on the potential impact of Fibre Broadband (FB) on cities in the UK.

Coverage of Cities

The cities considered for this work are all the cities which were eligible to bid for the UK Government's Urban Broadband Fund. These are the 10 cities that were eligible to bid for the first round of support and the remaining 26 cities for the second round. A full list is included as Appendix A. The analysis covers all those cities that were eligible to bid, not just those that have been successful so far. It is important to note that for purposes of this analysis all cities are defined by reference to their local authority boundaries[1]: so Manchester is the City of Manchester not Greater Manchester. There is a wide range in the size of the cities ranging from London with a population of 8.1 million down to Cambridge, Exeter and Gloucester with populations of around 120,000.

Purpose of the Index and How to Interpret It

The index of future Fibre Broadband potential (I-FB) is intended to provide an indication of the relative likely impact of Fibre Broadband in the UK's cities. Clearly, the overall scale of impact is, primarily, driven by the size of city and its business base and economy. Our index measures the potential impact on a city's business base: it does not take account of potential benefits to residents in their domestic use of Fibre Broadband or the role it might play in the delivery of public sector services.

The I-FB measures the potential relative impact on city competitiveness of a 100% roll out of Fibre Broadband across the city. It measures the gross effect of the full-roll out of Fibre Broadband across a city, it is not measuring the extent to which this has already taken place or is planned to take place. We focus on the future impact year when the benefits from 100% roll-out have fully accumulated.

Appendix B describes the key modelling assumptions used. The I-Fibre Broadband is driven by two main components:

- The first component of the index measures the relative Gross Value Added (GVA) uplift by improved productivity of existing businesses. The nature of the city's existing business base: are there higher or lower proportions of businesses likely to benefit from the roll-out of Fibre Broadband compared to the average. Generally cities that have a large share of their economy in small and medium sized enterprises (SMEs) will tend to benefit as will cities with lower levels of public sector employment[2]. Similarly, cities that tend to have a higher share of knowledge-based businesses are also more likely to see a higher impact.
- The second component of the index measures the benefits on enhanced business start-up rate that might occur. This tends to favour cities where the existing business start-up rate in those sectors where Fibre Broadband is likely to be most helpful in reducing start-up costs (by for instance easing access to cloud computing at reasonable cost and service levels).

1 With the exception of London which was defined using the NUTS 1 area for Greater London

2 This is not to say that FB cannot benefit larger firms or the public sect or, but that generally these organisations have already been able to procure access to FB via other means such as leased lines or dedicated networks

It is important to note that the I-FB measures the potential of Fibre Broadband impact based on assumed rates of take-up and adoptions and use by businesses. In practice the actual impact in any city could be higher or lower if the rates of take up and then adoption of services and ways of doing business that Fibre Broadband offers are experienced.

The international experience from the roll out of the last major wave of broadband (via ADSL) was that countries and economies that were more advanced and had a higher share of knowledge based businesses actually benefit proportionally more from broadband. This is, in effect, the key conclusions from our modelling of the potential impacts.

Appendix C provides a full list of the potential scale of impact of Fibre Broadband on GVA in each of the cities. The modelling of economic impacts can only be indicative as it is impossible to be sure what the rate of take-up will be and how far businesses use Super-Fast Fibre Broadband to drive and support productivity improvements. The potential impacts have therefore been presented as a range; the upper estimate models the potential impact if take up of Fibre Broadband reached 100% and the lower range shows the potential impacts if it reached 35%.

It should also be noted that these estimates are based on a subset of the total economy, focused on the economic benefits for SMEs. It excludes the following:

- Potential benefits to larger companies, since these businesses are likely to arrange their own high bandwidth connections through private leased lines, rather than accessing the public fibre network;
- Potential benefits to residents in their domestic use of Fibre Broadband;
- Efficiency savings to the public sector through the use of Fibre Broadband in the delivery of public sector services.

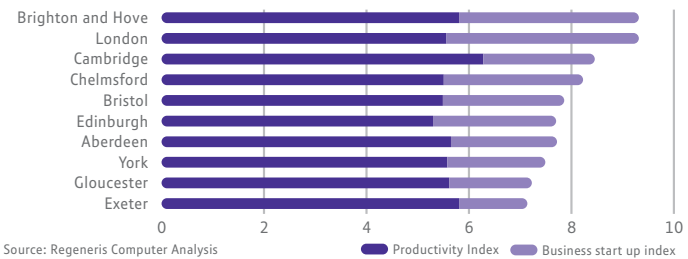
Results for Index of Super-Fast Broadband Potential

The results for the combined index are set out below in Figure 1. The index is out a 10 where 10 represents the highest potential impact relative to existing GVA of a city of the 100% roll-out of Fibre Broadband for both elements of the index: existing business impacts (63% weighting) and impact of faster business start-ups (37% weighting). Figures 2 and 3 show, respectively, the indices for existing business productivity and for business start-up impacts.

The key points are:

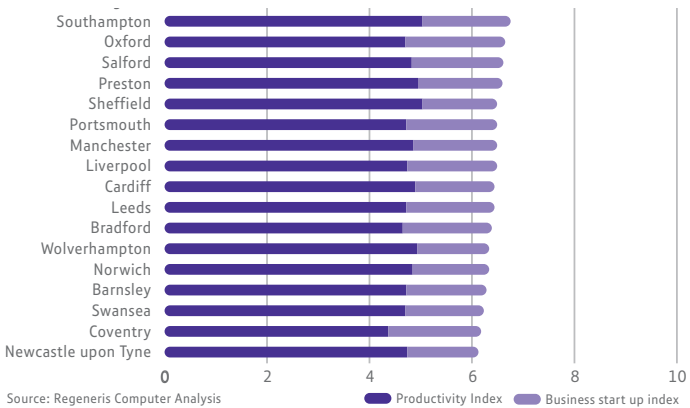
- There is a cluster of cities that potentially stand to gain most in proportional terms, including Brighton and Hove, London, Cambridge, Bristol, Aberdeen, Edinburgh and York. These are largely cities that would be recognised as having a relatively dynamic business base and strong assets in terms of knowledge intensive industries already based there.

Figure 1: Top Tier Cities in Index of Fibre Broadband Potential



- There is a middle tier of potential in terms of a large number of medium to larger cities spread across the UK such as Swansea, Cardiff, Manchester, Birmingham and Leeds. These are all areas where there is significant potential in absolute terms, but they are large cities and so the relative impact is reduce somewhat.

Figure 2: Middle Tier Cities in Index of Fibre Broadband Potential

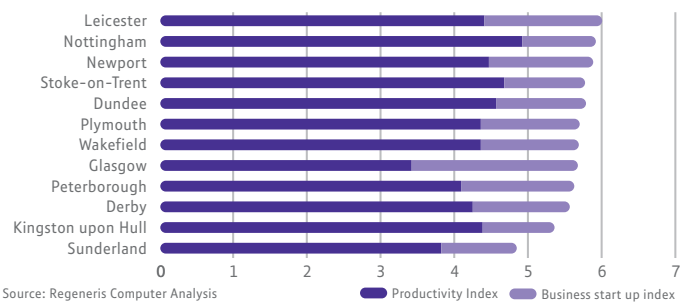


- Finally there is a smaller group of cities, such as Sunderland, Hull and Derby, which still stand to benefit from the roll out of Fibre Broadband, but could see the gap between themselves and cities in the top tier of the index widen as a result of the roll-out of Fibre Broadband. In many cases, these cities have a less dynamic business base, with lower rates of enterprise and fewer businesses in knowledge intensive sectors meaning they are less well placed to

exploit the key opportunities from Fibre Broadband. These are cities where there needs to be particular efforts to ensure the SME business base fully embrace Fibre Broadband and adopt changes to business practices that help better realise the potential from Fibre Broadband. However, for these cities to move themselves up the rankings of the index, this will have to occur alongside wider efforts to address some of the deeper seated economic challenges.

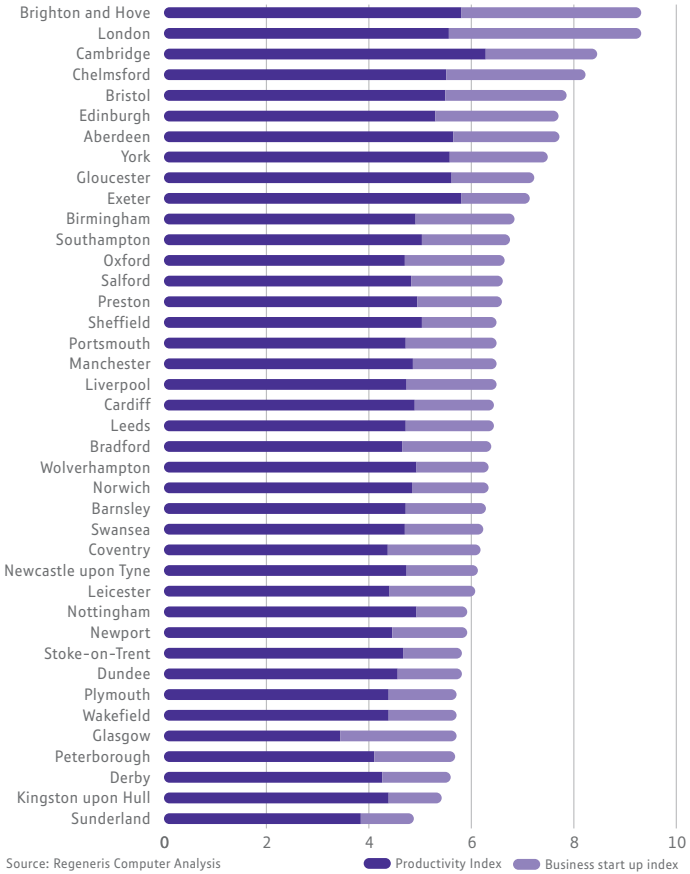
- Glasgow also appears as one of the lower placed cities, however this is largely due to the very high share of employment in larger firms (64%). Since these businesses are likely to arrange their own high bandwidth connections through private leased lines, this limits the potential economic impact from the roll out of the public access network (see page 52). However, these businesses could still secure the economic benefits from their private investment in fibre broadband.

Figure 3: Lower Tier Cities in Index of Fibre Broadband Potential



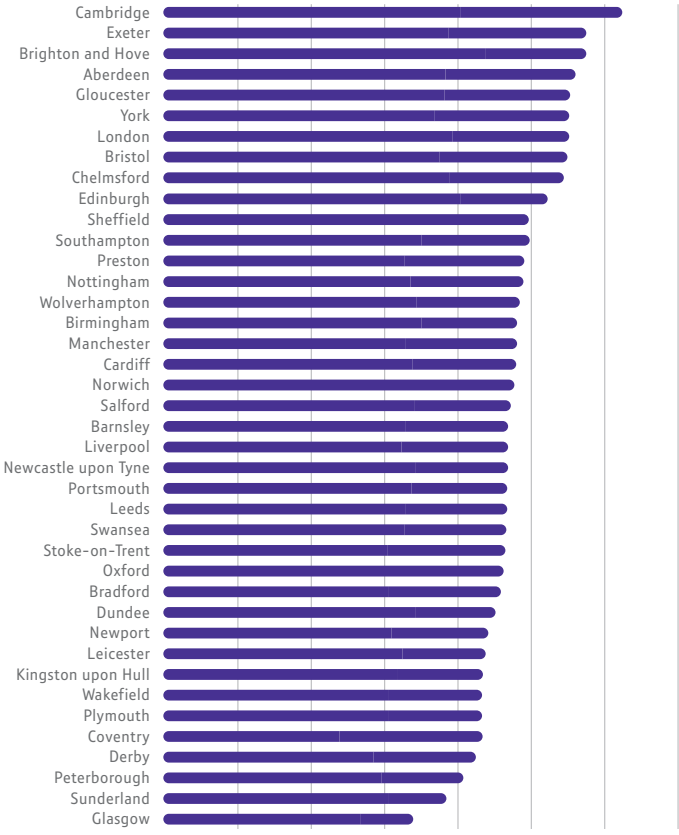
Source: Regeneris Computer Analysis

Figure 4: Overall Index of Fibre Broadband Potential in UK Cities



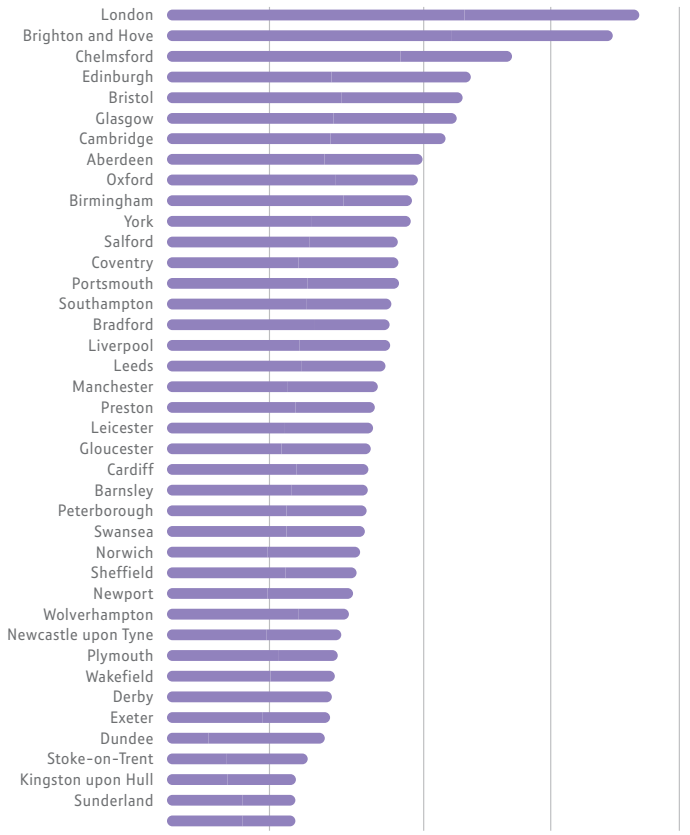
Source: Regeneris Computer Analysis

Figure 5: Index of Super-Fast Broadband Potential for Existing Businesses Only in UK Cities



Source: Regeneris Computer Analysis

Figure 6: Index of Super-Fast Broadband Potential for New Businesses Only in UK Cities



Source: Regeneris Computer Analysis

Appendix A: List of Cities Considered

City	Total business base (000s 2011)	Population (000s 2011)
Aberdeen	8.8	220
Birmingham	30.4	1,074
Bradford	14.7	523
Brighton and Hove	12.7	273
Bristol	15.9	428
Cambridge	4.7	123
Cardiff	10.3	345
Chelmsford	7.1	169
Coventry	8.7	317
Derby	6.8	249
Dundee	3.2	146
Edinburgh	17.1	495
Exeter	4.0	117
Glasgow	18.0	599
Gloucester	3.5	122
Kingston upon Hull	6.0	256
Leeds	24.7	751
Leicester	9.7	330
Liverpool	11.9	466
London	421.2	8,174
Manchester	16.1	503
Newcastle upon Tyne	7.6	279
Newport	3.8	146
Norwich	4.6	132
Nottingham	8.2	304
Oxford	4.5	150
Peterborough	5.7	185
Plymouth	5.9	257
Portsmouth	5.5	205
Preston	5.0	140
Salford	7.4	235
Sheffield	15.2	552
Southampton	6.1	236
Stoke-on-Trent	6.1	249
Sunderland	5.5	275
Swansea	6.3	239
Wolverhampton	6.7	250
York	6.5	198

Source: population from the 2011 Census (ONS © Crown Copyright); and business base a special analysis of ONS Business Demography data from the Interdepartmental Business Register (IDBR), this covers all businesses that are either VAT registered or have employees paid via PAYE. Note: all data for the single local authority area corresponding to the city

Appendix B: Technical Note on Estimates

Productivity Impacts

1) The same assumed adoption rate for Fibre Broadband has been applied to all cities in the index; the ranking of cities in the index therefore stays the same regardless of the adoption level.

2) Fibre Broadband will generate different impacts across businesses according to size and sector. A 2008 EC study estimated the productivity impacts generated under first generation ADSL broadband. It is assumed that these productivity improvements are broadly replicated as a result of the roll out of superfast broadband:

   I. Manufacturing & Construction: 0.14% increase in GVA per firm per annum

   II. Knowledge Intensive Sectors: 0.58% per annum

   III. Other Services: 0.32% per annum.

3) The estimates assume that productivity uplift impacts from the roll-out of Fibre Broadband are only felt by those businesses with fewer than 250 employees (i.e. SMEs). This is because it is assumed that these larger firms will have already accessed high bandwidth connectivity to run their business operations. Those areas with a relatively large share of their GVA produced by larger firms will tend to see a smaller proportional impact.

4) The estimates assume there are no productivity impacts in the public sector as a result of the roll-out of Fibre Broadband; again because it is assumed that public sector bodies such as universities, local and central government will have already accessed high bandwidth. This assumption is likely to under estimate the potential benefits because the ability of users of services to access higher bandwidth connections via Fibre Broadband may well drive improved service delivery of efficiency savings in the public sector.

5) Over time, greater impacts could be generated as broadband penetration increases and new applications are brought to the market. Under the central estimate, the model allows for a 5% increase on annual impact variables in the short-term (5 years), a 10% increase in the medium-term (10 years) and a 20% increase in the longer-term (15 years).

6) GVA per firm for different size bands was estimated for each city in the index by combining IDBR data for firms in each of the above sectors with GVA data from ONS for 2011.

7) The model assumes that displacement and substitution effects are zero. It is possible that the roll out of Fibre Broadband could displace some activity from outside cities, for instance by providing incentives for entrepreneurs to start a business in a city rather than elsewhere. However it is assumed that these effects would be limited since surrounding areas are all preparing their own Fibre Broadband plans through a combination of private and public investment.

Business Start-Up Impacts

8) The estimates for business start-ups have been informed by a study which estimates levels of business creation due to cloud computing in different sectors . The model took the lower estimate of new businesses to estimate the percentage annual increase in the business start-up rate at UK level.

9) This annual increase was then applied to the existing business start-up rate for each city in different sectors, using IDBR data from ONS Business Demography and VAT registrations.

10) It was assumed that all business start-ups created as a result of superfast broadband remain micro businesses with only one employee.

11) The model applies survival rates from ONS business demography to estimate the total number of surviving firms over a 15 year period.

The Index

12) For both measures all GVA impacts were scaled to estimates of existing GVA to give a relative impact measure for each city, this is then scaled to a ratio of the best performing city (which gets 100% of the score). The two scores are then weighted.

13) The index is calculated out a maximum of 10 where 10 represents the highest potential impact relative to existing GVA of a city of the 100% roll-out of Fibre Broadband for both elements of the index: existing business impacts (63% weighting) and impact of faster business start-ups (37% weighting). The weightings are based on the relative shares of employment between micro firms (representing start-ups) and all SMEs.

Appendix C: Estimated Increase in GVA due to Fibre Broadband

Estimated Increase in GVA in Year of Maximum Impact (£m)

City	35% take up	100% take up
Aberdeen	£9.3	£26.6
Barnsley	£2.9	£8.2
Birmingham	£23.4	£66.8
Bradford	£8.8	£25.0
Brighton and Hove	£8.4	£24.0
Bristol	£16.7	£47.7
Cambridge	£5.1	£14.7
Cardiff.	£8.7	£24.9
Chelmsford	£5.2	£14.9
Coventry	£6.2	£17.8
Derby	£5.8	£16.5
Dundee	£2.5	£7.0
Edinburgh	£23.0	£65.6
Exeter	£3.6	£10.4
Glasgow	£28.9	£48.
Gloucester	£2.9	£8.3
Kingston upon Hull	£3.7	£10.6
Leeds	£20.2	£57.6
Leicester	£5.4	£15.3
Liverpool	£6.6	£19.0

Estimated Increase in GVA in Year of Maximum Impact (£m)

City	35% take up	100% take up
London	£497.3	£1,420.9
Manchester	£15.1	£43.2
Newcastle upon Tyne	£6.3	£18.0
Newport.	£3.2	£9.2
Norwich	£3.9	£11.1
Nottingham	£7.6	£21.6
Oxford	£4.0	£11.4
Peterborough	£4.6	£13.0
Plymouth	£3.9	£11.2
Portsmouth	£5.1	£14.7
Preston	£3.0	£8.6
Salford	£6.0	£17.2
Sheffield	£8.5	£24.4
Southampton	£5.1	£14.7
Stoke-on-Trent	£3.9	£11.0
Sunderland	£3.9	£11.0
Swansea.	£3.4	£9.8
Wakefield	£5.4	£15.3
Wolverhampton	£4.6	£13.2
York	£5.3	£15.3

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